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Talk announcement

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Proximal gradient methods in Banach spaces

Proximal gradient methods are a popular tool for the solution of structured, nonsmooth minimization problems. In this talk, we investigate an extension of the former to general Banach spaces and provide worst-case convergence rates for, both, convex and nonconvex, problem instances. Moreover, assuming the Polyak–Łojasiewicz–Kurdyka property at stationary points, linear rates of convergence are derived. For specific problems, the proposed approach allows greater freedom in the choice of the variable space and thus to exploit potential curvature of the objective functional in the correct norms. We illustrate these benefits on bang-bang type optimal control problems with nonlinear partial differential equations which we lift onto the space of Radon measures. The resulting L^1-proximal gradient method can be efficiently implemented and leads to rapid convergence, mesh-independence as well as iterates exhibiting (almost) bang-bang structures. Its performance is compared to L^2-proximal as well as conditional gradient methods, further highlighting its practical benefits. This is joint work with Gerd Wachsmuth.